CLAIMS

1. A method for recording holographic storage media, comprising:

illuminating a data mask with a beam and recording a resulting modulated beam in a holographic storage medium, wherein the data mask includes an information layer that is divided into multiple data pages; and

propagating a reference beam to the holographic storage medium to record the multiple data pages of the data mask in parallel in the holographic storage medium.

2. The method of claim 1, wherein the recorded data pages are separated by approximately 1 micron to 10 mm.

3. The method of claim 1, wherein the recorded data pages spatially overlap.

4. The method of claim 1, wherein the information layer is propagated to a plane located outside of the holographic storage medium.

5. The method of claim 1, wherein the information layer is propagated to the holographic storage medium with a VanderLugt imaging system.

6. The method of claim 1, further including positioning the holographic storage medium near a Fourier transform plane of the data mask.

7. The method of claim 1, further including positioning the holographic storage medium near an image plane of the data mask.

8. The method of claim 1, wherein the data mask is propagated to the holographic storage medium without a lens.

9. The method of claim 1, wherein the object beam is confocally multiplexed to record multiple data masks.

10. The method of claim 1, wherein the holographic storage medium includes a rectangular card.

11. The method of claim 1, wherein the holographic storage medium includes a disc.

12. The method of claim 1, wherein the data mask includes a lithographic data mask adapted to image the information layer.

13. The method of claim 1, wherein the data mask includes a spatial light modulator adapted to image the information layer.

14. The method of claim 1, wherein the holographic storage medium includes a polytopic or angle filter.

15. The method of claim 1, wherein the data mask includes a holographic storage medium having a previously recorded information layer.

16. The method of claim 1, wherein the data mask includes a holographic storage medium with a plurality of previously recorded information layers having multiple data pages therein.

17. The method of claim 16, wherein the plurality of information layers are multiplexed onto the holographic storage medium using at least one multiplexing technique.

18. The method of claim 1, wherein a plurality of information layers are multiplexed onto the holographic storage medium using at least one multiplexing technique.

19. The method of claim 18, wherein successive information layers having multiple data pages are aligned to define multiple stacks of data pages.

20. The method of claim 18, wherein successive information layers having multiple data pages are aligned in a preselected arrangement such that authenticity of the medium may be determined.

21. The method of claim 18, wherein the information layers are both polytopic and wavelength multiplexed.

22. The method of claim 1, wherein the holographic storage medium includes holographic read only memory.

23. A holographic storage medium recorded by the method of claim 1.

24. A data mask for storing information in a holographic medium, comprising:

a data mask having an information layer adapted to be relayed and recorded into a holographic medium, wherein the information layer is grouped into a plurality of data pages.

25. The data mask of claim 24, wherein the data mask includes a lithographic mask.

26. The data mask of claim 24, wherein the data mask includes a holographic storage material with the information layer recorded therein.

27. The data mask of claim 24, wherein the data mask includes a spatial light modulator.

28. The data mask of claim 24, wherein the data mask includes multiple information layers.

29. The data mask of claim 28, wherein the multiple layers may be stored through one or more multiplexing methods.

30. A system for recording holographic storage media, comprising:

a light source; and

a data mask having an information layer adapted to be relayed and recorded into a holographic storage medium, wherein the information layer is grouped into a plurality of data pages.

31. The system of claim 30, further including a VanderLugt imaging system.

32. The system of claim 30, wherein the holographic storage medium is positioned near the Fourier transform plane of the information layer.

33. The system of claim 30, wherein the holographic storage medium is positioned near the Fourier transform plane of the data mask.

34. The system of claim 30, further including a filter at the Fourier transform plane of the data mask.

35. The system of claim 30, further including a repositioning mechanism adapted to move at least one of the data mask, the holographic storage medium, and an optical element.

36. The system of claim 30, further including an optical element for each data page of the data mask.

37. The system of claim 30, further including a phase mask.

38. The system of claim 30, further including a 4-F optical system.

39. The system of claim 30, further including substantially telecentric optical elements.

40. The system of claim 30, wherein the data mask includes a holographic storage medium.

41. The system of claim 30, wherein the data mask includes a spatial light modulator.

42. The system of claim 30, wherein the data mask includes a holographic storage material with the information layer stored therein.

43. A method for recording holographic storage media, comprising:

illuminating a holographic master data mask to reconstruct a stored information layer from the holographic master data mask and record the information layer onto a holographic storage medium with an object beam, wherein the holographic master data mask includes a holographic storage material; and

propagating a reference beam to the holographic storage medium to record the information layer.

44. The method of claim 43, wherein the at least one information layer includes a layer of data divided into multiple data pages that are recorded in parallel.

45. The method of claim 43, wherein two or more information layers are stored in the holographic master data mask and multiplexed to store multiple information layers in the holographic storage medium

46. The method of claim 43, wherein the holographic storage medium includes a holographic read only memory medium.

47. The method of claim 43, wherein the holographic master data mask is imaged with a VanderLugt imaging system onto the holographic storage medium.

48. The method of claim 43, wherein the holographic storage medium is positioned near the Fourier transform plane of the at least one information layer of the holographic master data mask when recording onto the holographic storage medium.

49. The method of claim 48, further including a filter at the Fourier transform plane of the holographic master data mask when recording onto the holographic storage medium.

50. The method of claim 43, wherein the holographic storage medium is recorded in a substantially telecentric system.

51. The method of claim 43, wherein multiple information layers are confocally stored in the holographic master, and confocally multiplexed onto the holographic storage medium when recording.

52. The method of claim 43, wherein multiple information layers are polytopically stored in the holographic master, and polytopically multiplexed onto the holographic storage medium when recording.

53. A holographic storage medium recorded by the method of claim 43.

54. A method for recording information into a holographic media, comprising:

positioning a holographic storage medium near a quasi Fourier transform plane of a data mask having information to be stored therein;

storing the information from the data mask in the holographic storage medium, wherein the data mask includes a plurality of data pages that are recorded onto the holographic medium in parallel.

55. The method of claim 54, wherein placing the holographic medium near a quasi Fourier transform plane includes a VanderLugt imaging system.

56. The method of claim 54, further including a filter at the Fourier transform plane.

57. The method of claim 54, wherein the holographic medium is recorded in a substantially telecentric system.

58. The method of claim 54, further including at least one of Bragg based multiplexing and momentum based multiplexing.

59. The method of claim 54, wherein the data mask includes a holographic storage medium.

60. A holographic storage medium recorded by the method of claim 54.

61. A method for recording information into a holographic storage medium, comprising:

confocally multiplexing a plurality of data masks into a holographic storage medium at two or more different distances from the center of the holographic storage medium, wherein at least one of the data masks includes an information layer divided into a plurality of data pages.

62. The method of claim 61, further including varying a lens to store the plurality of data masks at two or more different distances.

63. The method of claim 61, further including varying the image plane to store the plurality of data masks at two or more different distances.

64. The method of claim 61, further including varying a relative position of the holographic storage medium to store the plurality of data masks at two or more different distances.

65. The method of claim 61, further including storing at least a portion of the data masks stored in the holographic storage medium into a second holographic storage medium.

66. The method of claim 65, wherein the stored data masks are stored in the second holographic storage medium through confocal multiplexing.

67. The method of claim 61, wherein the data masks are readout of the holographic storage medium through confocal multiplexing.

68. The method of claim 61, wherein the plurality of data masks are formed by a spatial light modulator.

69. A holographic storage medium recorded by the method of claim 61.

70. A method for reading information from a holographic storage medium that was stored confocally, comprising:

illuminating a holographic storage medium including multiple information layers having multiple data pages centered at different locations on the holographic storage medium with a readout beam;

confocally filtering the resulting reconstruction to select a desired information layer; and

detecting at least a portion of an entire data page of the selected information layer in parallel.

71. The method of claim 70, wherein confocally filtering includes disposing an array of pinholes at the image plane.

72. The method of claim 70, further including varying the distance of the detector to the holographic storage medium to select the desired information layer.

73. The method of claim 70, further including varying at least a portion of a lens system to select the desired information layer.

74. The method of claim 70, further including varying the position of at least one of an image plane and detector plane to select the desired information layer.

75. A method for reading information stored in holographic storage media, comprising,

illuminating a holographic storage medium with a reference beam;

detecting information stored in the holographic storage medium with a detector placed at a distance from the holographic storage medium, wherein,

the holographic storage medium includes at least one information layer divided into a plurality of data pages stored therein and adapted to be detected at the distance of the detector.

76. The method of claim 75, wherein detecting information includes detecting an entire data page in parallel.

77. The method of claim 75, wherein detecting information further includes detecting a line of a data page at a time and scanning the line detector across the data page.

78. The method of claim 75, further including detecting multiple data pages in a pagewise fashion.

79. The method of claim 75, wherein detecting information includes using a phase conjugate reference beam.

80. The method of claim 75, wherein a holographic optical element is placed adjacent the detector.

81. The method of claim 75, further including repositioning at least one of the detector and the holographic storage medium to detect at least a second data page.

82. The method of claim 75, further including repositioning at least one of the detector and the holographic storage medium to detect at least a second information layer.

83. The method of claim 75, further including multiplexing the holographic storage medium to readout information from different information layers.

84. The method of claim 83, wherein the multiplexing includes wavelength multiplexing.

85. The method of claim 83, wherein the multiplexing includes polytopic multiplexing.

86. The method of claim 83, wherein the multiplexing includes wavelength and polytopic multiplexing.

87. The method of claim 75, wherein the detector includes at least one of a CMOS and CCD detector array.

88. The method of claim 75, wherein the detector oversamples the stored information.

89. A method for reading information stored in a holographic storage medium, comprising:

aligning a detector with a single data page stored in a holographic storage medium at a first location, wherein the storage medium includes multiple data pages centered at different locations across the medium;

detecting information from the data page at the first location in parallel; and

multiplexing the holographic storage medium to readout additional data pages in a stack of data pages at the first location.

90. The method of claim 89, further including aligning the detector with a second stack of data pages centered at a second location to detect data pages of the second stack.

91. The method of claim 89, wherein the act of multiplexing includes wavelength multiplexing.

92. The method of claim 91, wherein the wavelengths are varied for wavelength multiplexing with a tunable source including an electroabsorptive modulated laser.

93. The method of claim 91, wherein the wavelengths are varied for wavelength multiplexing with a tunable source that includes a MEMs structure on a laser cavity.

94. The method of claim 89, wherein a readout light source includes a laser that is pulsed.

95. The method of claim 89, wherein the multiplexing includes polytopic multiplexing.

96. The method of claim 89, wherein the multiplexing includes both wavelength and polytopic multiplexing.

97. The method of claim 89, wherein an alignment between different data pages in a single stack of data pages is determined.

98. The method of claim 97, wherein the determined alignment is used to authenticate the holographic storage medium.

99. The method of claim 89, wherein detecting information includes a phase conjugate beam and a phase conjugate readout system.

100. The method of claim 99, wherein the phase conjugate readout system is associated with the holographic storage medium.

101. The method of claim 99, wherein the phase conjugate readout system includes a phase mask.

102. A system for reading information stored in holographic storage media, comprising:

a light source; and

a detector, wherein the detector is adapted to detect multiple data pages stored in a holographic storage medium in a page-wise fashion.

103. The system of claim 102, wherein the detector includes an array of sensor elements.

104. The system of claim 102, wherein the detector includes at least one of a CMOS and CCD sensor array.

105. The system of claim 102, wherein the detector includes a line scanner.

106. The system of claim 102, further including a repositioning mechanism to move the detector relative to the holographic storage medium.

107. The system of claim 102, further including a repositioning mechanism adapted to move at least one of the detector, the holographic storage medium, and an optical element.

108. The system of claim 102, further including a holographic optical element.

109. The system of claim 102, further includes a holographic optical element disposed adjacent the detector.

110. The system of claim 102, wherein the detector detects the data pages without an optical lens.

111. The system of claim 102, wherein the light source includes a laser.

112. The system of claim 111, wherein the laser is configured to be pulsed.

113. The system of claim 102, wherein a wavelength of the laser may be varied.

114. The system of claim 102, wherein the light source includes a tunable source having an electroabsorptive modulated laser.

115. The system of claim 102, wherein the light source includes a tunable source having a MEMs structure on a laser cavity.

116. The system of claim 102, further including a phase mask.

117. The system of claim 102, further including a filter adapted to block out unwanted reconstructions.

118. The system of claim 102, further including a polytopic filter.

119. The system of claim 102, further including a filter disposed between the detector and the holographic storage medium.

120. The system of claim 119, wherein the filter includes an array of pinholes.